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INVERSION OF GRAVITY FIELDS FROM THE SPACECRAFT ORBITAL DATA USING AN ADJOINT OPERATOR APPROACH

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In perturbation approximation, the forward problem of orbital dynamics (equations with initial conditions) is linear with respect to variations of coordinates and/or velocities of the spacecraft and to corresponding variations of the gravity field in the models used. The linear operator adjoint to the linear operator of such forward problem turns out to be instrumental in inversion of differences between observed and predicted coordinates/velocities in terms of the updates of harmonics in the initial gravity field model. Based on this approach, the solution of resulting adjoint problem of orbital dynamics can be used to directly evaluate the matrix of partial derivatves of observable differences with respect to the gravity field harmonics. General discussion of the adjoint problem of orbital dynamics is given and an example of a mathematical formalism for the practical retrieval algorithm is presented.